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By-Berman, Abraham J.; Dorfman, Sheldon

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Projections of the number of jobs in 1970 and 1975, by occupation and industry, for New York State and its 11 major industrial areas are being developed through techniques described in this publication. The five major steps are: (1) to establish the number in the labor force by age and sex, (2) to establish the number of nonfarm and salary jobs by industry, (3) to establish the total number of jobs by industry, (4) to reconcile conceptual differences, and (5) to construct a matrix of the total number of jobs by occupation and industry division so that the industry totals correspond to the previously estimated figures. In the effort to fit the data from various sources together, it is necessary to find and add data to fill the gaps. Previous estimates have been off to some extent in absolute dimension but they have indicated the direction of change in various occupational fields and illuminated the problems of manpower. Tables in the document present New York 1960 data concerning the census population and labor force, total jobs by class of worker, reconciliation of the work force and labor force, census employment by occupational group and industry division, and adjustment of labor force participation rates to an annual basis. (DM)

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

NEW YORK STATE DEPARTMENT OF LABOR
Division of Research and Statistics
80 Centre St., New York, N.Y. 10013

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THE NEW YORK STATE DEPARTMENT OF LABOR'S MANPOWER PROJECTIONS FOR THE STATE AND ITS AREAS: A PRELIMINARY REPORT ON METHODOLOGY 1/

The Division of Research and Statistics of the New York State Department of Labor is now developing projections of the number of jobs in 1970 and 1975, by occupation and industry, for New York State and its eleven major industrial areas. In making them, the Department is utilizing -- as far as they are applicable -- the techniques and the over-all framework of the corresponding national projections of the U. S. Bureau of Labor Statistics, described in this bulletin.

The Division began by making estimates for 1960 and 1965 in the same detail as was desired for the 1970 and 1975 projections. The five main steps are listed below. Further on, each is described, first in connection with the 1960 benchmark figures and then in their application to later years.

(1) Labor force: To establish the number in the labor force, by age and sex.

(2) Nonfarm jobs: To establish the number of nonfarm wage and salary jobs, by industry.

(3) Total jobs: To establish the total number of jobs, by industry, by adding to #2: farm jobs, self-employed and unpaid family workers and domestics, as well as a distribution of government jobs, to conform to Census of Population industry concepts.

(4) Reconciliation: To reconcile the conceptual differences between #1 with #3.

(5) Matrix: To construct a matrix of the total number of jobs -- occupation by industry division -- in which the industry totals conform to those of #3.

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The resulting estimates for 1960 and 1965 and projections for 1970 and 1975 will form an integrated set. For each of the four years there is a reconciliation of labor-force estimates by age and sex with the conceptually different estimates of jobs by industry.

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1. Prepared by Abraham J. Berman, Principal Statistician, assisted by Sheldon Dorfman, Senior Statistician.

Benchmark Data for 1960

Before projections could be made, it was necessary to obtain a framework of past data. The benchmark year selected was 1960, since many of the needed basic data for the State and its areas had to come from the Census of Population. However, these data could not be used without a considerable amount of adjustment. They had to be integrated with data from other sources in order to obtain a set of data which was comparable to that used by BLS in its projection process. The adjustments made in the State series for 1960 are described in some detail, just below. Similar adjustments were made for the areas.

1. The civilian labor force, by age and sex

The basic 1960 Census of Population civilian labor force data for New York State, by age and sex (Table 1), were first adjusted to a Current Population Survey basis and then were further adjusted from the March-April 1960 Census period to a 1960 annual average basis (Tables 2 and 3). These adjustments were made by applying national relationships.

2. Nonfarm wage and salary jobs, by industry

It was essential to obtain a set of figures by industry in some detail -- the framework necessary for utilizing the BLS occupation-industry matrix. Nonfarm job data for New York State for 1960 from the BLS-State program had been published for manufacturing in selected 2-digit, 3-digit, and 4-digit detail and for nonmanufacturing in 1-digit and 2-digit detail. For some nonmanufacturing industries, particularly in Services, it was necessary to obtain greater detail than had been published. Most of this was obtained from unpublished estimates of the Office of Research and Statistics of the New York State Division of Employment. In the few cases where such figures were not available, estimates were made by interpolating between the 1959 and the 1962 data of County Business Patterns. The resulting number of nonfarm wage and salary jobs is shown in the second column of Table 4. (This table is limited to 2-digit industry detail).

3. Total jobs, by industry

The BLS national matrix includes self-employed and unpaid family workers, farm employees, and domestic employees, in addition to nonfarm employment. Column 3 in Table 4 shows New York State estimates for these elements and column 1 shows the total jobs figures that result from adding in these estimates.

Our first step toward making these estimates utilized the ratio of self-employed and unpaid family workers to private wage and salary workers, by industry, from Table 122 of the 1960 Census of Population. The ratios were applied to the average 1960 nonfarm wage and salary worker data and the resulting figures were totaled. Since the total did not agree with the total that had been obtained as part of the work force estimates of the Division of Employment -- using the U. S. Bureau of Employment Security methods -- it was necessary to adjust these figures. The adjustments were made in trade and service, large industry segments in which most self-employed are to be found. Data from the 1958 Census of Business seem to indicate somewhat higher ratios of self-employed among the workers of these industries than were indicated by the Census of Population ratios, and this fact was utilized in making the adjustments. The estimates of the Division of Employment, made as part of their work force series, of the number of farm and domestic workers were also added in, to obtain the total number of jobs.

The Census of Population concept of government employment by function or industry is utilized in the occupation-industry matrix; accordingly, the number of government workers in schools, hospitals, construction work, etc., had to be estimated and assigned to their respective industries. This is in contrast to the concept used in the nonagricultural wage and salary-work force series, in which all work for government agencies is considered a separate industry division, classified by employer, that is, into federal, state, and local. The basic source used to classify by function the state and local government work done in New York State was the Census of Governments for 1957 and 1962. Its classification proved to be far more satisfactory than that of the Census of Population, where government workers

appear in industries in which no governmental jobs exist in New York State. For federal employment, the basic source used was the insured employment record of the Division of Employment, where data are obtainable for individual federal agencies classified by industry. Table 4 indicates the number of government jobs, by industry. Added to the other elements in the table, these complete the estimate of total jobs, by industry, in 1960.

4. Reconciliation between jobs and labor force

By adding an estimate for unemployment to the total number of jobs (item #3, just above), we obtained a figure for total work force as defined by the Bureau of Employment Security. The concept of total work force for a state or an area differs from the concept of resident labor force in the following respects:

a. Persons on more than one payroll are counted only once in the labor force, but are counted in the work force figures for each job held.

b. Persons who live in one state or area and commute to work to a different state or area are counted where they reside in the labor force statistics, but where they work in the work force statistics.

c. Persons who have a job during the survey week, but are not at work and not paid, are reckoned as employed in labor force counts, but not in the work force statistics.

Table 5 indicates the size of these elements of difference between the civilian labor force count (less the unemployed) and the total job count in New York State for 1960. When this comparison was first made, a relatively small statistical discrepancy was found. It was eliminated by slightly increasing the labor force participation rates presented in column 5 of Table 2. This accounts for the difference between these rates and those finally used in Table 3.

5. The New York State industry-occupation matrix

It has been said that the major determinant of differences in occupation structure among areas is difference in industry structure. If industry structure were the only determinant, it would be possible to apply the national industry-occupation matrix to a state or area's industry structure and obtain a reasonably good set of occupation estimates.

Testing this possibility by using data on occupation by industry in the 1960 Census of Population showed us that, although industry differences do account for a great deal of the difference in occupation structure, other factors are important. 1/ The presence of central administrative offices, research laboratories, and other supporting activities of a given industry in one state and their absence in another will give the two states different job structures in the same industry. Another important factor is the state of technological advance at which different firms in different areas within the same industry operate. Consequently, it was felt that an independent matrix for New York State and its areas should be obtained by industry division and detailed occupation for the benchmark year 1960. Constructing it involved the following steps:

Step 1. Table 6 presents by industry division and occupation group the New York State employment data of Table 125 of the 1960 Census of Population. Such data are available for each state and for each major labor market area in the country.

Step 2. One deficiency in these raw data is that about 6 percent of employed persons are unclassified as to industry or occupation or both. It was necessary to allocate, within each industry division, the "not reported" element into occupations. There were large differences in the "not reported" element by age, sex, color, and area (New York Metropolitan Area vs. Remainder of State). For example, "not reported" among white males was 4 percent, among nonwhite males, 12 percent. The "not reported" element, therefore, was prorated separately within each age-sex-color group. Data in Census of Population Table 123 were drawn on for occupation distributions and Table 128 for industry distributions. Table 7 shows the resulting industry totals (column 1) and occupation totals (row 1.) The cross tabulation of Table 6 was then adjusted to the new marginal totals (omitting the "not reported" group) by a pro rata process. 2/

1. See Berman, Abraham J., "Problems of Manpower Projections in New York State," Temple University Bulletin, June 1966, p. 27.
2. For a short method of iterating a cross tabulation to marginal totals, see Dening, W. Edwards, Statistical Adjustment of Data, Dover Publications, Inc., 1964 edition, p. 121 ff.

The following table presents a comparison for the "not reported" group, by industry division and by occupation group. The first column shows the result that would have been obtained if the pro-rating had been made on the basis of the total distribution with the "not reported" group omitted. The second column presents the result of pro-rating the "not reported" group in each age-sex-color-area cell separately and adding the results. The resulting distribution reflects the differences in the proportion of "not reported" in each cell and indicates that higher proportions of lower-skill workers should be used in adjusting for this group.

PERCENT DISTRIBUTION OF "NOT REPORTED" BY INDUSTRY AND OCCUPATION

Industry division and occupation group	"Not reported" prorated	
	proportionately	by age, color, sex and area
All industries	100.0	100.0
Agriculture	1.9	1.5
Mining	0.2	0.2
Manufacturing	30.2	29.0
Construction	5.2	4.5
Transportation and public utilities	8.1	7.9
Wholesale and retail trade	19.2	19.4
Finance, insurance, and real estate	6.6	6.9
Services and miscellaneous	23.6	25.7
Public administration	5.0	4.8
All occupations	100.0	100.0
Professional, technical and kindred workers	13.3	12.5
Managers, officials and proprietors a/	10.6	8.9
Clerical and kindred workers	19.3	20.7
Sales workers	7.8	7.5
Craftsmen, foremen and kindred workers	13.2	11.3
Operatives	19.3	19.9
Service workers (including private household)	12.1	14.4
Laborers (including farm)	4.5	4.8

a/ Includes farmers and farm managers.

Step 3. Table 8 shows the results of step 3, which was to shift the occupation distribution by industry division from its Census residence basis (Table 7) to a total jobs basis (Table 4).

Step 4. Within the Table 7 framework of industry division and occupation group, detailed occupation estimates by industry division were then made. Table 125 of the 1960 Census of Population gives information on the industry distribution

in New York State of some individual occupations. The detail needed for most individual occupations, however, is not given in that table. Most individual occupations are grouped into an all-other category within each occupation group. For these all-other categories, information on New York totals of individual occupations can be obtained from Table 120 in the Census volume. Information for the country as a whole, given in Census Volume PC 2 (7C), was utilized to prorate the individual occupations within the all-other group on an industry division basis. These estimates were totaled and prorated to agree with the industry division breakdown of the all-other group for the State. In this way, a set of detailed occupational statistics by industry division, using Census data, was obtained. These data were then adjusted to a total jobs basis by prorating the breakdown of occupations in each industry division to the totals by occupation group obtained in Step 3 and shown in Table 8.

This procedure can be illustrated by indicating how the number of jobs by detailed occupation was derived for one occupation group -- professional, technical, and kindred workers; jobs by detailed occupation within the other occupation groups were derived in a similar manner. We begin with Census Table 125 for New York State, which shows an industry breakdown for 19 specified professional occupations for males and 8 for females. The first step, then, was to fill in the data for those occupations in which data for one sex was missing. This was done by using the national patterns in Census Report PC 2 (7C). The following table uses female lawyers as an example.

ESTIMATING THE NUMBER OF FEMALE LAWYERS BY INDUSTRY DIVISION IN NEW YORK STATE IN 1960

Industry division	United States		New York State
	Number	Percent	
Total employment	7,140	100.0	1,450
Manufacturing	39	0.5	7
Contract construction	101	1.4	20
Transportation and public utilities	40	0.6	9
Wholesale and retail trade	61	0.9	13
Finance, insurance, and real estate	383	5.4	78
Services and miscellaneous	4,768	66.9	971
Public administration	1,728	24.3	352
Not reported	20	-	-

Their national percent distribution by industry division, applied to the 1,450 employed female lawyers in New York State (this figure is taken from Census Table 120) yields their estimated employment by industry division in the State. In the same manner employment estimates were derived for the other professional occupations in which data for either sex were missing. By using the above procedure, estimates were made for missing detailed occupation-sex components, and the resulting "other" group was made consistent for each sex by subtracting these estimates. Totals for the "other" group, by industry division, were made in this manner for the State and each area.

Since the matrix needed figures for individual occupations included in the "other" group, they were estimated by utilizing the data from Census Volume PC 2 (7C). The following table uses librarians (male and female) as an example.

ESTIMATING THE TOTAL NUMBER OF LIBRARIANS IN NEW YORK STATE BY INDUSTRY DIVISION IN 1960

Industry division	United States		New York State
	Number	Percent	
Total employment	84,332	100.0	8,800
Agriculture	80	0.1	9
Mining	62	0.1	9
Manufacturing	122	0.1	9
Contract construction	2,432	2.9	258
Transportation and public utilities	404	0.5	44
Wholesale and retail trade	321	0.4	36
Finance, insurance, and real estate	360	0.4	36
Services and miscellaneous	77,466	92.1	8,177
Public administration	2,843	3.4	302
Not reported	242	-	-

Their national percent distribution by industry division was applied to the 8,880 librarians in New York State (from Table 120). The other professional occupations were treated in the same way.

However, the national occupation-by-industry distribution for "other" professionals differs from New York State's, so that, when all such estimates were added up, the sums by industry division differed from those previously derived for "other" professionals. Therefore, the data had to be prorated using an iterative procedure 1/ so that the sum of the detailed occupations by industry division add

1. Idem.

up to the number of "other" professionals and at the same time each individual occupation by industry division adds up to its occupation total as shown in Table 120.

After estimates were obtained for each of the Census professional occupations, by industry division, the detailed occupation data were prorated to add up to total professional jobs by industry division, shown in Table 8. For example, in manufacturing, in order to shift professional employment by detailed occupation from a Census basis to a total jobs basis, the Census figure for each occupation was multiplied by 0.981 (the ratio of the 166,700 jobs shown in Table 8 to the 169,900 resident employed shown in Table 7). A similar breakdown of jobs by detailed occupation and industry division was made for each of the other cells.

Step 5. It is well known and documented by Census follow-up studies that there are deficiencies in Census information about occupations, which were obtained from one member of a household. Consequently, it was desirable to use other data where available. We utilized our own study of technicians, scientists, and engineers, as of 1962, 1/ and our own study of the metal trades, as of 1957. 2/ We used New York State Education Department data on the number of teachers and on licensees in several professional occupations, such as physicians. We also utilized New York State data on the number of apprentices. Most important of all, we utilized occupational data from a 1960 wage study that covered most nonmanufacturing industries in the State. 3/

In many cases, the occupational figures from these sources, when adjusted to a 1960 basis, were different from those in the 1960 Census. Since they were basically more reliable than the Census having been compiled in the main from

1. New York State Department of Labor, Division of Research and Statistics, Technical Manpower in New York State.
2. New York State Department of Labor, Division of Research and Statistics, Manpower in Selected Metal Crafts in New York State, Publication B-107.
3. New York State Department of Labor, Division of Research and Statistics, Wages and Hours in Industries Covered by the Minimum Wage Law, New York State, 1960-1961, Publication B 132.

employer reports, we substituted them for the Census data, wherever they applied. This was not a simple process, since we had to work within the over-all framework of the job totals by industry division previously compiled; and it meant in some cases that the totals by occupational group had to be shifted. Increasing the number of workers in one occupation because of known outside data meant that the number in other occupations had to be reduced. By and large, where such adjustments did not offset each other, they were made in the "all other" category of the group. The largest adjustments among occupation group totals involved a shift from sales workers to clerical workers and laborers in retail trade. Our 1960 retail trade wage study showed a larger proportion of workers in clerical occupations (checker, etc.) and laborers (stock boy) than did the Census, and showed a smaller proportion in sales than did the Census.

Table 9 presents the final detailed occupation-by-industry-division distribution of the number of jobs in the State in 1960. A similar distribution was prepared for each area.

Estimates for 1965

Once the benchmark set of data described above was completed for 1960, we prepared to make a set of estimates for 1965. The procedure used for the industry-occupation matrix for 1965 was similar to that utilized for 1970 and 1975, which will be described at a later stage in this paper. Nonfarm employment by industry for 1965 was available from the same sources as in the case of the 1960 data.

Total job figures for 1965 were calculated by using the same method as in 1960. The ratios for self-employed and unpaid family workers to wage and salary workers obtained in 1960 were utilized for 1965, and the results were adjusted to agree with the total available from the New York State Division of Employment's work force estimate. Federal government workers for 1965 were distributed by industry, using Division of Employment data. To distribute State and local government employment, data from the Division of Employment and the Census Bureau's

Governments Division were utilized. 1/ Where no data were available, distributions from the 1962 Census of Governments were used.

The only new element that arose in estimating the data for 1965 was in the calculation of labor force by age and sex. We utilized, for this purpose, a set of population estimates and projections at 5-year intervals by 5-year age-sex groups, compiled by the Cornell Aeronautical Laboratories for the State Office of Planning Coordination. 2/ These population estimates were adjusted to a noninstitutional civilian population basis by utilizing the information for 1960 and by assuming that the changes in these groups from 1960 to 1965 were the same in each age-sex group as those in the population as a whole. Labor force participation rates were then estimated, first by utilizing the change that occurred nationally in each age-sex cohort between 1960 and 1965. 3/ Applying these ratios to the population figures, we found that the resulting estimate for total civilian labor force showed an increase of about 3.5 percent between 1960 and 1965. About 3.1 of the 3.5 percent represented the result of population changes (we learned this by applying the 1960 participation rates to the 1965 population).

In contrast to the 3.5 percent change between 1960 and 1965 in estimated civilian labor force, there was a change of only 2.9 percent in estimated work force. It was possible that the current population counts by age and sex were wrong, or that the work force estimates were wrong. But this seemed unlikely, because the work force estimates are in large part determined by actual measurement for the State and because the population estimates, except for net migration, are similarly determined. The discrepancy would have to be sought in one of the other elements of the estimating process. Tremendous changes could have taken place in

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1. See Public Employment in 1965 and City Employment in 1965. Also, New York State Civil Service Commission, Distribution of New York State Positions by County and Agency, 1964.
2. New York State Executive Department, Office of Planning Coordination, Demographic Projections for New York State Counties.
3. Cooper, Sophia and Johnston, Denis, "Labor Force Projections for 1970-1980," Monthly Labor Review, February 1965, p. 130.

the net commutation pattern, but considering the nature of New York City's work force, where most of the net commutation takes place, this hardly appeared likely. The one remaining element of major significance was our assumption that New York's labor force participation rates had changed between 1960 and 1965 at the same rate as those nationally. If this factor was responsible, a reasonable set of figures with which to reconcile our 1960 and 1965 data by age, sex, and industry might be obtained by using changes in national participation rates, but with modifications between 1960 and 1965, particularly for women. We did this and were able to obtain a reconciliation for 1965 between the total number of jobs and the labor force similar to the one for 1960, given in Table 5.

Projections for 1970 and 1975

1. Labor force and nonfarm employment projections

The projections for 1970 and 1975 build on the base of population projections made for the State Office of Planning Coordination by the Cornell Aeronautical Laboratories, which were mentioned earlier. This set of projections had the advantage of presenting figures for each county of the State, so that area projections could be made on the same basis as for the State as a whole. They were amended to a civilian noninstitutional basis in a manner similar to that used for 1960.

Changes shown by national projections of labor force participation rates were now utilized to obtain a first approximation of the labor force in 1970 and 1975, and these figures were later amended by a method similar to that described in connection with the 1965 data, in order to reconcile the labor force totals with the total job figures. Unemployment was assumed to average 4 percent for the State as a whole. In some areas, lower levels of unemployment appeared to be reasonable; in other areas, somewhat higher levels were used.

Several procedures were used, on an experimental basis, to project nonagricultural employment for 1970 and 1975. One approach was to use logarithmic regression, another to use linear regression. Both were applied to the State-wide

employment data, and then both were applied to the State data as a percent of the United States data. The results of these four methods were compared and the decision was made to utilize as the basic regression model Log Y = a + bt, where Y represents for each industry the percent that New York's employment is of national employment for each year of the period 1947-1965, and t = time in years.

These proportions were projected to 1970 and 1975 and (being in terms of percent of national nonagricultural employment) were multiplied by the BLS national employment projections (on a 4-percent-unemployment-level base) to obtain projected employment in New York State for 1970 and 1975.

For industries where a more detailed breakdown was needed than 2 digits in manufacturing and 1 digit in nonmanufacturing, the trend of New York's employment as a percent of United States employment between 1960 and 1965 was extrapolated to 1970 and 1975. The reason for using 1960 and 1965 to find a trend, rather than seeking a longer-range trend, was the lack of comparable data for New York State, its areas, and the United States, at the 3-digit level, before 1958. In addition, 1960 was the year in which the standard for a coverage under the New York State Unemployment Insurance Law was reduced to one employee or more; so that, beginning with 1960, insured employment data could be used without small-firm adjustments. The resulting percentages were multiplied by the BLS national projections and prorated to the 2-digit manufacturing and 1-digit nonmanufacturing totals previously projected by the regression line method. The table on the following page gives an example of this process for two industry subgroups that together constitute industry group X. The projections for the two subgroups (line J in the table) add up to 112,200. This is a little more than the 111,400 that the regression-line method yielded for industry group X. Prorating scales the two subgroup figures down proportionately, so that their sum just equals 111,400 (line M).

PROJECTION OF TOTAL JOBS TO 1970 FOR 3-DIGIT SUBGROUPS
OF 2-DIGIT INDUSTRY GROUP X

Step	Subgroup A	Subgroup B	Total = Industry group X
A. 1960 national estimate	326,400	27,900	354,300
B. 1960 State estimate	95,700	6,100	101,800
C. 1960 national-State ratio (B/A)	0.293	0.219	-
D. 1965 national estimate	352,900	29,800	382,700
E. 1965 State estimate	96,800	7,400	104,200
F. 1965 national-State ratio (E/D)	0.274	0.248	-
G. Ratio of 1960 ratio to 1965 ratio (F/C)	0.935	1.132	-
H. 1970 national-State ratio (GxE)	0.256	0.281	-
I. 1970 national projection	400,000	35,000	435,000
J. 1970 State projection (HxI)	102,400	9,800	112,200
K. 1970 State regression-line projection	-	-	111,400
L. Ratio of K to J	-	-	0.993
M. 1970 State projections pro-rated to K	101,700	9,700	111,400

Area estimates of nonfarm jobs by industry were made by similar methods. These will be described in a forthcoming technical bulletin of the Division of Research and Statistics.

The total nonagricultural employment estimate in each area that resulted from this procedure was then compared with the independently estimated labor force figures, and adjustments were made to reconcile the two sets of projections. These adjustments, in most cases, were minor and did not significantly affect the overall estimating framework. When the estimates were completed, a set of labor force and nonagricultural employment figures, together with a reconciliation sheet, was sent to knowledgeable people within the New York State Departments of Labor and Commerce to check for possible circumstances that the calculations could not take account of -- for example, a new plant known to be moving into an area or an important old plant about to leave the area, etc. The estimates were also checked wherever possible with projections made by other agencies. Again, some slight adjustments in our projections were made as a result of such local contacts. Since data for most of 1966 were available by the time the projections were completed, a

check was made of 1965-66 trends to determine whether or not the 1965-70 trends were in line; some adjustments resulted from this appraisal. All the adjustments in the projections resulted in changing the final 1975 projections by less than 1 percent over-all. Of course, in some industries, particularly in manufacturing, the amount of adjustment was somewhat greater.

2. Jobs by industry

After the nonagricultural employment figures by detailed industry by area had been prepared, it was necessary to change these figures from a wage and salary worker concept to a total jobs concept. This meant that the number of self-employed workers had to be added to each industry in each area, and that government workers had to be distributed by industry. The breakdown for government workers by industry or function which had been worked up for 1960 and 1965 was used as a basis for extrapolating to 1970 and 1975 within the framework of total government employment projections derived from the regression equation. Projections for total self-employed persons and domestic employees were based on the assumption that the percent they were of nonagricultural employment would change at only half the annual rate that prevailed during the 1960-1965 period, since both sectors declined sharply during that period. The number of self-employed in each industry was estimated by using 1960 ratios and then prorating the results to their total estimates. Trends derived from the 1958 and 1963 Censuses of Business were examined in order to make adjustments in the trade and service sectors as to the number of self-employed. Licensing trends also were consulted, for example, the trend in physician licenses. Agricultural employment for each area was derived from United States Department of Agriculture data, and trends determined from these data were utilized to project this segment of employment.

3. Occupation projections

We have already described for the benchmark year 1960, the process that we used for obtaining total jobs, by detailed occupation and industry division. From the BLS, a detailed industry-by-occupation matrix is available for the years

1960 and 1975. This matrix gives for each of 116 industries the percent distribution for each of 162 occupations. The 1960 national matrix was applied to the total number of jobs in New York State for each of the 116 industries and a set of occupation totals in each of 9 industry divisions in each of the 162 occupations was thus obtained. Ratios were then determined in each occupation-industry-division cell between the occupation figures obtained as a result of applying the 1960 national matrix and the independently estimated occupation figures from Table 9. For 1975, the national matrix was applied to the independently projected New York State figures for the total number of jobs, by industry, and totals were again obtained on a detailed occupation and industry division basis. To these totals, the 1960 ratios were then applied in each cell, and projections for New York State by detailed occupation and industry division for 1975 comparable to the independently estimated New York State data for 1960 were thus obtained. The following table illustrates this procedure for accountants:

Industry division	1960			1975	
	State independent estimates A	State based on national matrix B	Ratio of A to B C	State based on national matrix D	Adjusted State projections (C x D) E
Total, all accountants	69,300	58,187		68,925	82,100
Agriculture	100	20	5.000	33	200
Mining	300	65	4.615	114	500
Construction	1,100	1,023	1.075	1,633	1,800
Manufacturing	14,400	11,313	1.273	11,548	14,700
Transportation and public utilities	4,800	3,897	1.232	3,898	4,800
Trade	6,400	6,214	1.030	6,254	6,400
Finance, insurance, and real estate	8,700	6,492	1.340	5,595	7,500
Services	26,800	24,601	1.089	33,988	37,000
Public administration	7,200	4,562	1.578	5,861	9,200

A. From Table 9.

B. The BLS industry-occupation matrix for 1960 applied to total jobs in New York State in each of 116 industries; e.g., there were 333,400 jobs in apparel in 1960 in New York State which when multiplied by 0.09%-the percent that accountants are of apparel nationally as shown in the BLS matrix-gives an estimate of 300 accountants. The number of accountants in each of the 116 industries were then added to obtain the 9 industry division totals shown in this column.

D. Similar to column B using the 1975 BLS matrix and 1975 New York State total job projections.

This mechanical procedure could be modified where small numbers are involved (agriculture, mining) by using absolute differences rather than ratios, e.g., for accountants, in agriculture, 100-20 + 33 = 113 projected accountants in 1975.

After the projections were completed for all cells, the figures were totaled and comparisons made between 1960 and 1975. In several cases, where occupation data were available for a series of years for New York State from other sources, independent projections were made and amendments were then made in the projections that resulted from the mechanical process outlined above. Such data were available from licensing sources for doctors, dentists, and several other professional groups and for teachers from the State Education Department. Independent projections were made for technicians by using the methodology described in a report of the New York State Department of Labor on Technical Manpower in New York State. 1/ A check was also made on the difference in 1950-1960 trends by occupation in the nation and New York State as shown by 1950 and 1960 Census data, and these relationships were also utilized in amending the results of the matrix calculation.

For 1965 and 1970, occupation projections were obtained by a method similar to that used for 1975. It was first necessary to obtain a national matrix for these two years. This was done by interpolating the 1960-1975 proportions for each occupation in each industry.

Replacement and Job Mobility

After we find the expected growth or decline in the number of jobs by occupation, we then add to these figures the number of deaths and retirements, estimated from working-life tables computed by BLS for the nation on the basis of 1960 patterns. These patterns were applied to Census occupation distributions, by age and sex, for the State and its areas. These rates were then applied to an

1. New York State Department of Labor, Division of Research and Statistics, Technical Manpower in New York State, Volume I, Supplement B, "Job Projections in Technical Occupations."

average of the number in the occupation in 1960 at the beginning and in 1975 at the end of the period and a reasonable approximation can thus be made of the number of job vacancies that can be expected as a result of deaths and retirements from the work force during 1960-1975. 1/

To complete the picture, an estimate should be made of the number of jobs that will be created in each occupation by job shifts as people move up and down the occupational ladder. This area of job mobility is a most important one in terms of job replacement needs, particularly at lower occupation levels, and a great deal of research is needed to determine its extent. With the present state of information available on this subject, it very well may be that our estimates of this factor will be crude and possibly limited to occupational groups only.

Conclusions

The problem of future manpower projections is like a jig-saw puzzle in which many important pieces are missing, and this is particularly true when one attempts to make such projections for a State and its areas. It is possible, however, to fit a great many pieces together and, with better data and techniques, it should be possible, in the future, to find and add some of the missing pieces. Although previous national, State, and New York City projections may have been off the mark in absolute dimension, they did point out fairly well the direction of change in the various occupational fields and they have illuminated the problems in the manpower field during the 1960's. We hope and expect that our present projections will come closer to the target.

A future publication of the Division of Research and Statistics will present the methodology of the projection process used for New York State in greater detail.

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1. Ibid, p. 14 ff.

New York State Department of Labor
Division of Research and Statistics

Table 1. CENSUS POPULATION AND LABOR FORCE, NEW YORK STATE, 1960
(in thousands)

Age and sex	Resident population	Institutional population	Resident armed forces	Civilian noninstitutional population	Civilian labor force	Civilian labor force participation rates
Male, 14+	5,882.2	121.5	40.1	5,721	4,555	79.6
14-19	653.4	11.4	5.0	637	203	31.9
20-24	433.7	8.7	14.0	411	350	85.2
25-34	1,055.2	18.0	11.7	1,026	986	96.1
35-44	1,126.6	16.5	7.3	1,103	1,070	97.0
45-54	1,036.1	17.1	1.8	1,017	972	95.6
55-64	842.8	18.2	0.3	824	723	87.7
65+	734.5	31.6	-	703	251	35.7
Female, 14+	6,506.5	98.4	1.0	6,407	2,403	37.5
14-19	677.4	5.8	0.2	671	178	26.5
20-24	500.1	2.5	0.3	497	262	52.7
25-34	1,132.3	6.6	0.2	1,126	413	36.7
35-44	1,234.3	9.2	0.1	1,225	534	43.6
45-54	1,124.3	11.8	0.1	1,112	559	50.3
55-64	913.3	13.8	0.1	899	347	38.6
65+	924.7	48.7	-	876	110	12.6

Source: U. S. Bureau of the Census, U. S. Census of Population: 1960, Volume I, Part 34 New York, Tables 115 and 107.

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Table 2. ADJUSTMENT OF THE NEW YORK STATE CENSUS CIVILIAN LABOR FORCE PARTICIPATION RATES TO AN ANNUAL BASIS COMPARABLE WITH THE U. S. CURRENT POPULATION SURVEY (CPS), 1960

Age and sex	NY Census civilian labor force participation rates (percent) (1)	Ratio of US participation rates April CPS ÷ Census (2)	NY participation rates adjusted by US CPS-Census ratio (percent) (3)	Ratio of US participation rates Annual average ÷ March-April average (4)	Annual NY State civilian labor force participation rate, 1960 (percent) (5)
Male					
14-19	31.9	1.092	34.8	1.123	39.1
20-24	85.2	1.018	86.7	1.013	87.8
25-34	96.1	1.011	97.2	1.005	97.7
35-44	97.0	1.008	97.8	1.001	97.9
45-54	95.6	1.017	97.2	1.003	97.5
55-64	87.7	1.017	89.2	1.005	89.6
65+	35.7	1.067	38.1	.997	38.0
Female					
14-19	26.5	1.074	28.5	1.162	33.1
20-24	52.7	1.020	53.8	1.024	55.1
25-34	36.7	1.010	37.1	1.020	37.8
35-44	43.6	1.030	44.9	1.000	44.9
45-54	50.3	1.055	53.1	1.014	53.8
55-64	38.6	1.055	40.7	1.019	41.5
65+	12.6	1.009	12.7	1.019	12.9

(1) From Table 1.
(2) Derived from the Gordon Committee report (Measuring Employment and Unemployment, pp. 381-382) by taking the ratio of the April CPS to Census.
(3) Column (1) multiplied by column (2).
(4) Ratio of annual average labor force participation rates to the average of the March-April labor force participation rates, taken from the Monthly Report on the Labor Force.
(5) Column (3) multiplied by column (4).

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Table 3. NEW YORK STATE CIVILIAN POPULATION AND LABOR FORCE, 1960
(in thousands)

Age and sex	NY State civilian noninstitutional population (1)	Annual NY State civilian labor force participation rates (2)	NY State civilian labor force (3)
Total, 14+	12,161	59.8	7,273
Male, 14+	5,737	82.0	4,704
14-19	648	39.2	254
20-24	415	88.0	365
25-34	1,021	97.9	1,000
35-44	1,105	98.2	1,085
45-54	1,017	97.4	991
55-64	825	89.7	740
65+	706	38.1	269
Female, 14+	6,424	40.0	2,569
14-19	680	33.8	230
20-24	500	54.9	275
25-34	1,123	37.8	425
35-44	1,225	45.0	551
45-54	1,113	53.8	599
55-64	901	41.6	375
65+	882	12.9	114

1. The April 1960 civilian population was moved to July by linear interpolation between the April 1960 Census Population and the July 1965 Population estimates prepared by the N. Y. State Office of Planning Coordination.
2. Based on Table 2 column 5, adjusted to eliminate the statistical discrepancy in Table 5. (See text p. 4)
3. Column (1) multiplied by column (2).

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Table 4. TOTAL JOBS IN NEW YORK STATE BY CLASS OF WORKER, 1960
(in thousands)

Industry	Total jobs	Nonagricultural wage and salary employment 1/	Self-employed, unpaid family workers, agricultural employment and domestics	Government
Total employment	7,265.0	5,344.2	1,083.0	837.8
Manufacturing	1,951.2	1,878.8	57.0	15.4
Durable goods manufacturing	948.8	911.2	22.2	15.4
Lumber and wood products	18.8	16.4	2.4	-
Furniture and fixtures	37.4	35.5	1.9	-
Stone, clay and glass products	50.0	48.6	1.4	-
Primary metal industries	77.5	77.1	0.4	-
Fabricated metal products (including ordnance, except fire control equipment)	105.4	100.0	3.0	2.4
Machinery, except electrical	162.0	159.1	2.9	-
Electrical machinery, equipment and supplies	166.9	165.7	1.2	-
Transportation equipment	112.1	98.6	0.5	13.0
Instruments (including fire control equipment)	121.6	116.8	4.8	-
Miscellaneous manufacturing	97.1	93.4	3.7	-
Nondurable goods	1,002.4	967.6	34.8	-
Food and kindred products	163.0	156.7	6.3	-
Tobacco manufactures	2.9	2.8	0.1	-
Textile mill products	65.4	63.3	2.1	-
Apparel and other finished products	333.4	318.9	14.5	-
Paper and allied products	70.2	69.4	0.8	-
Printing, publishing and allied industries	180.2	172.9	7.3	-
Chemicals and allied products	90.3	89.2	1.1	-
Petroleum refining and related industries	12.9	12.8	0.1	-
Rubber and miscellaneous plastics products	20.8	20.2	0.6	-
Leather and leather products	63.3	61.4	1.9	-

Table 4 (cont'd)

Industry	Total jobs	Nonagricultural wage and salary employment 1/	Self-employed, unpaid family workers, agricultural employment and domestics	Government
Agriculture, forestry and fisheries	174.7	9.5	163.5	1.7
Agriculture	173.0	9.2	162.1	1.7
Forestry	0.5	-	0.5	-
Fisheries	1.2	0.3	0.9	-
Mining	9.5	9.1	0.4	-
Metal mining	3.1	3.0	0.1	-
Oil and gas extraction	1.5	1.4	0.1	-
Nonmetallic mining and quarrying	4.9	4.7	0.2	-
Construction	379.0	261.8	71.4	45.8
Transportation, communication and public utilities	584.3	482.2	25.3	76.8
Railroads	65.5	65.3	0.2	-
Air transportation	39.6	37.0	0.1	2.5
Local and interurban passenger transportation	87.2	44.1	7.8	35.3
Motor freight transportation and warehousing	86.8	75.0	11.8	-
Water transportation	73.7	68.4	0.3	5.0
Pipelines	0.2	0.2	-	-
Services incidental to transportation	23.8	20.6	3.2	-
Communication	116.0	115.7	0.3	-
Electric, gas and sanitary services	91.5	55.9	1.6	34.0
Wholesale and retail trade	1,540.6	1,251.1	286.8	2.7
Wholesale trade	484.2	419.3	64.9	-
Retail trade	1,056.4	831.8	221.9	2.7
Lumber, building materials, farm equipment	41.7	31.9	9.8	-
General merchandise stores	166.5	149.4	15.6	1.5
Food stores	200.4	145.4	55.0	-

Table 4 (cont'd)

Industry	Total jobs	Nonagricultural wage and salary employment 1/	Self-employed, unpaid family workers, agricultural employment and domestics	Government
Automotive dealers and gasoline service stations	101.7	78.5	23.2	-
Apparel and accessories	116.2	99.0	17.2	-
Furniture, homefurnishings and equipment	50.3	37.7	12.6	-
Eating and drinking places	252.8	202.1	49.5	1.2
Miscellaneous retail stores	126.8	87.8	39.0	-
Finance, insurance and real estate	531.5	483.2	37.8	10.5
Banking and credit agencies	137.9	136.8	1.0	0.1
Brokers and investment companies	63.5	58.7	4.8	-
Insurance	169.3	162.4	6.4	0.5
Real estate	160.8	125.3	25.6	9.9
Services	1,763.6	968.5	440.8	354.3
Hotels and lodging places	81.7	72.4	9.2	0.1
Personal services	160.9	102.5	58.4	-
Miscellaneous business services	197.6	170.0	27.6	-
Automobile repair services and garages	36.0	26.2	9.8	-
Miscellaneous repair services	28.3	15.8	12.5	-
Motion pictures and other amusement and recreation services	84.8	72.3	10.4	2.1
Medical and other health services	375.5	193.4	62.0	120.1
Legal services	50.2	30.2	20.0	-
Educational services and museums	347.2	108.9	10.2	228.1
Nonprofit membership organizations	123.1	115.2	4.0	3.9
Miscellaneous services	90.4	61.6	28.8	-
Private household workers	187.9	-	187.9	-
Public administration	330.6	-	-	330.6
Postal service	79.8	-	-	79.8
Other federal	62.9	-	-	62.9
State	41.4	-	-	41.4
Local	146.5	-	-	146.5

1. Excluding government.

New York State Department of Labor
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Table 5. WORK FORCE AND LABOR FORCE RECONCILIATION
NEW YORK STATE
(in thousands)

	1960
1. Adjusted census civilian labor force	7,273
2. a. Unemployment rate (percent)	5.0
b. Unemployed	363
3. a. Resident employed	6,910
b. Less nonagricultural self-employed and unpaid family workers and domestics	920
c. Less agriculture	163
4. Census nonagricultural resident wage and salary workers	5,827
5. BLS nonagricultural wage and salary workers	6,182
6. Difference	355
7. Net commutation	144
8. Dual job holders less those with a job but not being paid	211
9. Discrepancy	-

1. For derivation of 1960 see Table 3, column 3.
2. From N. Y. State Department of Labor, Division of Employment, estimated by using the Bureau of Employment Security method.
3. a. Row 1 minus row 2b.
b and c. N. Y. State Department of Labor, Division of Employment, estimated by Bureau of Employment Security method.
4. U. S. Census of Population, Volume I, Part 34, Table 122.
5. U. S. Bureau of Labor Statistics, Employment and Earnings for States and Areas 1939-1965, Bulletin (1370-3).
7. Data for SMSA's can be obtained from Population Census PC2 (6B), Journey to Work. In deriving net commutation for New York State the data were taken from the New York State Department of Commerce, Commuting from County to County in New York State (Research Bulletin No. 11); however, for States where no such data is available, a good approximation of commuting patterns can be derived by using Table 132 of the Population Census for the State and contiguous States (commutation from noncontiguous States is relatively small). People who live in one State and commute to work in another are counted in the civilian labor force by place of residence (rows 1 and 4) and are counted in the nonagricultural employment data by place of work (row 5).
8. Dual job holders are counted more than once in the BLS nonagricultural wage and salary workers figures (row 5) but not in the Census nonagricultural resident wage and salary workers (row 4). National data suggests that dual jobs amount to 5 percent of all jobs and this factor (actually 4.9 percent) was used for the State. Those with a job but who did get paid during the week because they were sick, on vacation or on strike were counted among the Census resident wage and salary workers but not among the BLS nonagricultural wage and salary workers. This amounts to about 1.5 percent of the labor force nationally and was used for the State. A net rate of 3.4 percent (4.9 minus 1.5) multiplied by row 5 was used to derive row 8.

If BLS nonagricultural employment (row 5) plus agricultural employment (row 3c) plus self-employed and unpaid family workers and domestics (row 3b) are added together, we get total jobs (7,265,000 in 1960). If unemployment (row 2b) is added we get total work force.

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Table 6. CENSUS EMPLOYMENT IN NEW YORK STATE, OCCUPATION GROUP BY INDUSTRY DIVISION, 1960

Industry division	Total, all occupations	Professional	Managers 1/	Clerical	Sales	Craftsmen	Operatives	Service workers 2/	Laborers 3/	Not Reported
Total, all industries	6,599,462	825,021	654,266	1,195,851	483,177	818,262	1,197,249	747,148	277,391	401,097
Agriculture	118,850	2,552	63,232	1,499	507	996	2,123	511	47,332	98
Mining	11,531	939	879	1,722	92	2,712	4,781	195	-	211
Construction	321,894	16,312	29,279	15,735	1,548	171,737	24,691	2,380	57,668	2,544
Manufacturing	1,886,379	159,494	119,961	277,143	80,983	339,231	801,517	24,158	54,489	29,403
Transportation	508,572	26,746	36,493	134,087	3,939	98,071	135,340	19,245	48,418	6,233
Trade	1,202,643	32,782	226,805	195,692	326,060	83,576	126,448	168,738	27,847	14,695
Finance	409,243	17,801	67,742	206,440	55,906	8,867	2,825	38,557	6,561	4,544
Service	1,474,825	530,414	80,605	219,499	12,116	94,326	86,927	419,369	17,007	14,562
Public administration	313,773	35,440	25,652	138,388	243	15,936	8,139	71,418	13,918	4,639
Not reported	351,752	2,541	3,618	5,646	1,783	2,810	4,458	2,577	4,151	324,168

1. Includes farmers and farm managers.
2. Includes private household workers.
3. Includes farm laborers.

Source: U. S. Census of Population, Volume I, Part 34, Table 125.

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Table 7. CENSUS EMPLOYMENT IN NEW YORK STATE, OCCUPATION GROUP BY INDUSTRY DIVISION, 1960 1/

Industry division	Total, all occupations	Professional	Managers 2/	Clerical	Sales	Craftsmen	Operatives	Service workers 3/	Laborers 4/
Total, all industries	6,599,462	874,991	689,810	1,279,052	513,172	863,758	1,276,952	805,032	296,695
Agriculture	123,966	2,620	65,248	1,563	524	1,025	2,204	535	50,247
Mining	12,093	998	935	1,851	98	2,880	5,121	210	-
Manufacturing	1,988,552	169,900	127,835	298,563	86,474	360,699	859,176	26,165	59,740
Contract construction	337,851	17,164	30,819	16,740	1,633	180,350	26,147	2,548	62,450
Transportation and public utilities	536,426	28,337	38,683	143,659	4,183	103,721	144,309	20,733	52,801
Wholesale and retail trade	1,270,790	34,856	241,238	210,380	347,504	88,676	135,262	182,400	30,474
Finance, insurance and real estate	433,681	18,923	72,040	221,870	59,570	9,407	3,020	41,671	7,180
Services and miscellaneous	1,565,335	564,637	85,832	236,230	12,928	100,177	93,039	453,861	18,631
Public administration	330,768	37,556	27,180	148,196	258	16,823	8,674	76,909	15,172

1. "Not reported" were prorated by age, sex, color, and residence.
2. Includes farmers and farm managers.
3. Includes private household workers.
4. Includes farm laborers.

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Table 8. TOTAL JOBS IN NEW YORK STATE, OCCUPATION GROUP BY INDUSTRY DIVISION: PRORATED FROM A CENSUS RESIDENT EMPLOYMENT BASIS TO A TOTAL JOB BASIS
(in thousands)

Industry division	Total, all occupations	Professionals	Managers 1/	Clerical	Sales	Craftsmen	Operatives	Service workers 2/	Laborers 3/
Total, all industries	7,265.0	960.5	799.5	1,413.0	601.2	921.5	1,317.8	912.6	338.9
Agriculture	174.7	3.7	92.0	2.2	0.7	1.4	3.1	0.8	70.8
Mining	9.5	0.8	0.7	1.4	0.1	2.3	4.0	0.2	-
Manufacturing	1,951.2	166.7	125.4	293.0	84.8	353.9	843.1	25.7	58.6
Contract construction	379.0	19.3	34.6	18.8	1.8	202.2	29.3	2.9	70.1
Transportation and public utilities	584.3	30.9	42.1	156.5	4.6	113.0	157.1	22.6	57.5
Wholesale and retail trade	1,540.6	42.3	292.5	255.0	421.3	107.5	164.0	221.1	36.9
Finance, insurance and real estate	531.5	23.2	88.3	271.9	73.0	11.5	3.7	51.1	8.8
Services and miscellaneous	1,763.6	636.1	96.7	266.2	14.6	112.9	104.8	511.3	21.0
Public administration	330.6	37.5	27.2	148.0	0.3	16.8	8.7	76.9	15.2

1. Includes farmers and farm managers.
2. Includes private household workers.
3. Includes farm laborers.

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Table 9. TOTAL NUMBER OF JOBS IN NEW YORK STATE BY DETAILED OCCUPATION AND INDUSTRY DIVISION, 1960
(in thousands)

Occupation	Total	Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Public administration
Total occupation	7,265.0	174.7	9.5	379.0	1,951.2	584.3	1,540.6	531.5	1,763.6	330.6
Professional, technical and kindred	930.5	4.5	0.9	20.9	169.3	34.5	43.6	23.7	592.2	40.9
Engineers, technical	84.8	0.1	0.1	8.7	45.4	6.4	5.1	1.0	14.1	3.9
Engineers, aeronautical	1.7	-	-	-	1.3	0.1	-	-	0.2	0.1
Engineers, chemical	7.3	-	-	0.7	5.2	-	0.4	-	1.0	-
Engineers, civil	16.0	-	-	5.6	1.3	1.5	0.3	0.4	4.7	2.2
Engineers, electrical	26.1	-	-	0.7	17.0	3.5	1.1	-	2.8	1.0
Engineers, industrial	5.8	-	-	-	3.6	0.4	0.5	0.5	0.8	-
Engineers, mechanical	22.8	-	-	1.7	14.7	0.8	2.0	0.1	3.0	0.5
Engineers, metallurgical, etc.	1.5	-	-	-	1.1	-	0.1	-	0.3	-
Engineers, mining	0.1	-	0.1	-	-	-	-	-	-	-
Other engineers, technical	3.5	0.1	-	-	1.2	0.1	0.7	-	1.3	0.1
Natural scientists	17.9	0.5	0.1	0.1	10.7	0.3	1.3	0.1	3.9	0.9
Chemists	10.2	-	-	0.1	6.9	0.3	1.1	-	1.4	0.4
Agricultural scientists	0.7	0.5	-	-	0.2	-	-	-	-	-
Biological scientists	1.7	-	-	-	0.7	-	-	-	0.9	0.1
Geologists and geophysicists	0.4	-	0.1	-	0.1	-	0.1	-	0.1	-
Mathematicians	1.8	-	-	-	1.1	-	0.1	0.1	0.4	0.1
Physicists	2.7	-	-	-	1.7	-	-	-	0.7	0.3
Natural scientists, n. a. c.	0.4	-	-	-	-	-	-	-	0.4	-
Technical workers and specialists (excl. medical and dental) 1/	124.8	0.1	0.1	8.0	58.7	15.9	6.2	2.3	22.7	10.8
Draftsmen	21.0	-	-	1.2	9.6	1.2	0.6	0.1	8.0	0.3
Structural design technicians and related specialists	2.6	-	-	0.6	0.5	0.1	0.1	-	1.3	-

Table 9 (cont'd)

Occupation	Total	Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Public administration
Electro and mechanical engineering technicians	41.0	-	-	0.1	23.4	8.8	2.9	-	4.4	1.4
Electronic	10.6	-	-	-	7.7	0.4	0.1	-	1.8	0.6
Electrical	8.5	-	-	-	3.5	3.6	0.1	-	0.7	0.6
Mechanical	8.3	-	-	0.1	6.5	0.4	0.1	-	1.1	0.1
Electro-mechanical	13.6	-	-	-	5.7	4.4	2.6	-	0.8	0.1
Mathematics technicians	0.8	-	-	-	0.6	-	-	-	0.2	-
Physical science technicians	8.7	0.1	0.1	-	6.6	0.2	0.2	-	1.3	0.2
Industrial engineering technicians	6.9	-	-	-	5.0	0.2	0.1	-	1.1	0.5
Civil engineering and construction technicians	13.1	-	-	6.0	0.1	0.7	0.1	0.2	3.1	2.9
Sales and service technicians	2.0	-	-	0.1	0.8	-	0.9	-	0.1	0.1
Technical writing and illustration technicians	3.6	-	-	-	2.2	-	-	-	1.3	0.1
Safety and sanitation inspectors and related specialists	3.9	-	-	-	0.3	-	-	0.5	0.4	2.7
Product testing and inspection, specialists	8.2	-	-	-	7.0	0.1	0.1	-	0.5	0.5
Data processing, systems analysis and programming specialists	5.9	-	-	-	2.2	0.4	1.1	1.5	0.5	0.2
Airway tower specialists and flight dispatchers	1.4	-	-	-	-	0.3	-	-	0.1	1.0
Broadcasting, motion picture and recording studio specialists	2.9	-	-	-	0.2	2.3	-	-	0.3	0.1
Radio operators	2.8	-	-	-	0.2	1.6	0.1	-	0.1	0.8
Medical and other health workers	186.4	1.6	-	-	2.6	0.1	12.9	0.4	167.9	0.9
Dentists	14.7	-	-	-	-	-	-	-	14.7	-
Dietitians and nutritionists	3.9	-	-	-	-	-	0.1	-	3.8	-
Nurses, professional	70.2	-	-	-	1.7	0.1	0.2	0.2	67.5	0.5

Table 9 (cont'd)

Occupation	Total	Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Public administration
Nurses, student	10.6	-	-	-	-	-	-	-	10.6	-
Optometrists	1.5	-	-	-	-	-	0.4	-	1.1	-
Osteopaths	0.8	-	-	-	-	-	-	-	0.8	-
Pharmacists	13.8	-	-	-	-	-	12.1	-	1.7	-
Physicians and surgeons	38.0	-	-	-	0.2	-	0.1	0.1	37.4	0.2
Technicians, medical and dental	24.6	0.4	-	-	0.7	-	-	0.1	23.2	0.2
Veterinarians	1.2	1.2	-	-	-	-	-	-	-	-
Chiropractors and therapists	7.1	-	-	-	-	-	-	-	7.1	-
Teachers	191.0	-	-	-	0.5	0.2	1.0	0.1	188.2	1.0
Teachers, elementary	94.7	-	-	-	-	-	0.1	-	94.5	0.1
Teachers, secondary	55.6	-	-	-	-	-	-	-	55.5	0.1
Teachers, other except college	21.9	-	-	-	0.5	0.2	0.9	0.1	19.4	0.8
Teachers, college	18.8	-	-	-	-	-	-	-	18.8	-
Social scientists	10.4	-	-	0.1	2.2	0.7	1.0	1.6	3.6	1.2
Economists	3.5	-	-	-	1.2	0.3	0.6	0.4	0.3	0.7
Psychologists	2.5	-	-	-	0.1	-	-	-	2.4	-
Statisticians and actuaries	4.0	-	-	0.1	0.9	0.4	0.4	1.2	0.6	0.4
Other social scientists	0.4	-	-	-	-	-	-	-	0.3	0.1
Other professional, technical and kindred	315.2	2.2	0.6	4.0	49.2	10.9	16.1	18.2	191.8	22.2
Accountants and auditors	69.8	0.1	0.3	1.1	14.4	4.8	6.4	8.7	26.8	7.2
Airplane pilots and navigators	3.0	-	-	-	0.3	2.2	0.1	-	0.2	0.2
Architects	5.1	-	-	0.3	0.2	-	-	0.6	3.8	0.2
Artists, athletes, entertainers	54.7	0.7	-	-	-	1.0	3.4	0.2	48.1	1.3
Clergymen	15.8	-	-	-	0.1	-	-	-	15.7	-
Designers, except design draftsmen	6.6	-	-	-	3.6	-	1.4	-	1.6	-
Editors and reporters	16.9	-	-	0.1	13.2	0.5	0.6	0.1	2.3	0.1
Foresters and conservationists	0.6	0.2	-	-	-	-	-	-	-	0.4
Lawyers and judges	40.7	-	0.1	0.1	1.0	0.5	0.7	2.0	33.1	3.2
Librarians	9.5	-	-	-	0.3	0.1	0.1	0.1	8.7	0.2

Table 9 (cont'd)

Occupation	Total	Agri-culture	Mining	Con-struction	Manu-facturing	Trans-portation	Trade	Finance	Ser-vices	Public adminis-tration
Personnel and labor relations workers	11.8	-	0.1	0.1	5.0	0.8	1.1	0.8	1.8	2.1
Photographers	8.1	-	-	-	2.0	-	0.3	-	5.7	0.1
Social and welfare workers	19.9	-	-	-	-	-	-	0.1	12.7	7.1
Professional, technical, kindred n. e. c.	52.7	1.2	0.1	2.3	9.1	1.0	2.0	5.6	31.3	0.1
Managers, officials and proprietors	797.3	85.8	1.1	34.4	126.7	43.6	293.4	81.7	107.9	22.7
Conductors, railroad	4.1	-	-	-	-	4.1	-	-	-	-
Credit men	6.0	-	-	-	1.2	0.1	3.6	0.8	0.3	-
Officers, pilots, engineers, ship.	4.8	0.2	-	0.2	0.2	4.1	-	-	0.1	-
Postmasters and assistant postmasters	1.7	-	-	-	-	-	-	-	-	1.7
Purchasing agents	13.1	-	0.1	0.5	7.9	0.6	2.0	-	1.2	0.8
Managers, officials, proprietors, n. e. c.	767.6	85.6	1.0	33.7	117.4	34.7	287.8	80.9	106.3	20.2
Clerical and kindred workers	1,443.0	2.3	1.4	21.0	291.9	156.6	282.0	269.2	269.2	149.4
Stenos, typists and secretaries	358.4	0.9	0.8	6.4	78.7	18.3	47.1	68.1	111.8	26.3
Secretaries	231.4	0.7	0.6	4.5	53.1	10.0	32.7	38.9	80.5	10.4
Stenographers	38.7	-	0.1	0.9	7.7	2.5	3.6	5.7	11.2	7.0
Typists	88.3	0.2	0.1	1.0	17.9	5.8	10.8	23.5	20.1	8.9
Office machine operators	50.4	-	0.1	0.2	14.2	4.1	8.1	13.7	6.0	4.0
Billing and bookkeeping machine operators	17.2	-	0.1	0.1	4.6	1.0	2.6	6.5	2.1	0.2
Key punch operators	12.9	-	-	-	3.5	1.4	1.8	3.3	1.2	1.7
Tabulating machine operators	11.2	-	-	-	3.0	1.1	1.6	2.9	1.0	1.6
Other office machine operators	9.1	-	-	0.1	3.1	0.6	2.1	1.0	1.7	0.5

Table 9 (cont'd)

Occupation	Total	Agri-culture	Mining	Con-struction	Manu-facturing	Trans-portation	Trade	Finance	Ser-vices	Public adminis-tration
Other clerical and kindred workers	1,034.2	1.4	0.5	14.4	199.0	134.2	226.8	187.4	151.4	119.1
Accounting clerks	46.9	-	-	2.4	9.6	3.2	15.6	7.5	6.4	2.2
Bookkeepers, hand.	79.3	0.4	0.1	2.0	19.9	2.7	27.9	16.1	9.5	0.7
Bank tellers	20.6	-	-	-	-	-	-	20.6	-	-
Cashiers	58.4	-	-	-	1.5	3.1	43.4	2.4	7.4	0.6
Mail carriers	23.7	-	-	-	-	-	-	-	-	23.7
Postal clerks	35.0	-	-	-	-	-	-	-	-	35.0
Shipping and receiving clerks	45.8	-	-	0.1	27.1	1.8	14.8	0.2	1.4	0.4
Telephone operators	56.0	-	0.1	0.3	4.6	32.1	4.3	3.2	9.9	1.5
Clerical and kindred n. e. c.	668.5	1.0	0.3	9.6	136.3	91.3	120.8	137.4	116.8	55.0
Sales workers	568.6	0.7	0.1	2.1	82.6	4.6	385.4	71.5	21.2	0.4
Insurance agents and brokers	41.3	-	-	-	-	-	-	41.2	0.1	-
Real estate agents and brokers	19.5	-	-	0.1	-	0.1	-	19.1	0.2	-
Sales workers, n. e. c.	507.8	0.7	0.1	2.0	82.6	4.5	385.4	11.2	20.9	0.4
Craftsmen, foremen and kindred workers	929.3	1.7	2.0	199.6	384.6	110.5	98.0	10.9	105.1	16.9
Construction craftsmen	224.9	0.3	0.6	157.6	30.9	9.9	6.8	2.5	13.0	3.3
Carpenters	66.3	0.2	0.1	48.8	8.2	1.9	2.6	0.5	3.3	0.7
Brickmason, stone, tile setters	19.4	-	-	17.0	1.3	0.1	0.6	0.3	0.1	-
Cement and concrete finishers	1.8	-	-	1.8	-	-	-	-	-	-
Electricians	34.6	-	0.1	14.3	10.2	4.6	1.0	0.4	3.2	0.8
Excavating, grading, machine operators	11.0	0.1	0.4	9.3	0.5	0.5	0.1	-	0.1	-
Painters and paperhangers	42.6	-	-	32.0	1.8	1.0	1.2	0.9	4.4	1.3
Plasterers	4.8	-	-	4.4	0.2	-	-	0.1	0.1	-
Plumbers and pipefitters	33.9	-	-	22.6	5.7	1.8	1.2	0.3	1.8	0.5
Roofers and slaters	4.7	-	-	4.5	0.1	-	0.1	-	-	-
Structural metalworkers	5.8	-	-	2.9	2.9	-	-	-	-	-
Foremen, n. e. c.	123.0	0.5	0.4	10.5	76.0	13.1	13.4	0.9	5.5	2.7

Table 9 (cont'd)

Occupation	Total	Agri-culture	Mining	Con-struction	Manu-facturing	Trans-portation	Trade	Finance	Ser-vices	Public adminis-tration
Metalworking craftsmen	133.3	-	0.1	4.2	122.5	2.5	1.0	-	2.3	0.7
Machinists prod. and tool-room and maintenance	37.2	-	0.1	0.5	33.5	1.4	0.5	-	0.8	0.4
Machine tool operators, Class A	29.6	-	-	-	29.4	0.1	-	-	0.1	-
Blacksmiths, forge, hammermen	1.9	-	-	0.1	1.2	0.2	-	-	0.2	0.2
Boilermakers	1.6	-	-	0.3	0.6	0.3	-	-	0.4	-
Heat treaters, annealers, etc.	1.4	-	-	-	1.4	-	-	-	-	-
Millwrights	4.8	-	-	0.4	4.3	0.1	-	-	-	-
Molders, metal (exc. cormks)	3.4	-	-	-	3.4	-	-	-	-	-
Patternmakers metal and wood.	3.6	-	-	-	3.4	-	-	-	0.2	-
Rollers and roll hands	2.2	-	-	-	2.2	-	-	-	-	-
Tinsmiths	11.3	-	-	2.9	7.3	0.3	0.4	-	0.3	0.1
Toolmakers and diemakers	15.4	-	-	-	14.9	0.1	0.1	-	0.3	-
Electroplaters	1.0	-	-	-	1.0	-	-	-	-	-
Assemblers, metalwork, Class A	12.4	-	-	-	12.4	-	-	-	-	-
Inspectors, metalwork, Class A	7.5	-	-	-	7.5	-	-	-	-	-
Selected printing trades craftsmen	47.1	-	-	0.1	44.0	0.2	0.6	0.4	1.5	0.3
Compositors and typesetters	27.4	-	-	-	25.5	0.1	0.4	0.3	1.0	0.1
Electrotypers and stereotypers	1.1	-	-	-	1.1	-	-	-	-	-
Engravers, except photoengravers	2.0	-	-	-	1.7	-	0.1	-	0.1	0.1
Photoengravers and lithographers	4.5	-	-	-	4.4	-	-	-	0.1	-
Pressmen and plate printers	12.1	-	-	0.1	11.3	0.1	0.1	0.1	0.3	0.1
Selected skilled occ. trans., p.u.	30.9	-	-	1.1	0.8	28.7	-	-	0.1	0.2
Linemen, servicemen, telephone, telegraph and power	24.5	-	-	1.1	0.7	22.4	-	-	0.1	0.2
Locomotive engineers	4.0	-	-	-	0.1	3.9	-	-	-	-
Locomotive firemen	2.4	-	-	-	-	2.4	-	-	-	-

Table 9 (cont'd)

Occupation	Total	Agri-culture	Mining	Con-struction	Manu-facturing	Trans-portation	Trade	Finance	Ser-vices	Public adminis-tration
Mechanics and repairmen	226.5	0.8	0.5	15.0	56.8	38.5	46.2	6.0	54.7	8.0
Airplane mechanics and repairmen	11.2	-	-	-	3.7	6.6	0.2	-	0.3	0.4
Motor vehicle mechanics	58.3	0.3	-	0.7	3.6	7.2	23.2	-	21.8	1.5
Office machine mechanics	4.3	-	-	-	0.6	-	2.2	-	1.4	0.1
Radio and TV mechanics	11.3	-	-	0.1	0.7	0.6	3.1	-	6.7	0.1
Railroad and car shop mechanics	3.5	-	-	-	-	3.5	-	-	-	-
Other mechanics and repairmen	137.9	0.5	0.5	14.2	48.2	20.6	17.5	6.0	24.5	5.9
Other craftsmen and kindred workers	143.6	0.1	0.4	11.1	53.6	17.6	30.0	1.1	28.0	1.7
Bakers	18.8	-	-	-	12.3	-	5.3	-	1.1	0.1
Cabinetmakers	6.9	-	-	0.6	4.4	0.1	0.8	-	0.9	0.1
Cranemen, derrickmen, hoistmen	8.4	-	0.2	1.7	4.9	1.0	0.5	-	-	0.1
Glaziers	1.8	-	-	0.6	0.4	-	0.8	-	-	-
Jewelers and watchmakers	6.9	-	-	-	0.9	-	3.3	-	2.6	0.1
Loom fixers	0.2	-	-	-	0.2	-	-	-	-	-
Millers	0.5	-	-	-	0.5	-	-	-	-	-
Opticians, lens grinders, etc.	4.4	-	-	-	1.7	-	2.1	-	0.6	-
Stationary engineers	28.3	-	0.2	0.2	12.5	5.3	1.5	1.1	6.3	1.2
Inspectors, log and lumber	0.3	-	-	-	0.3	-	-	-	-	-
Inspectors, other	9.8	-	-	1.9	1.5	5.2	0.5	-	0.7	-
Upholsterers	6.4	-	-	-	2.7	0.1	1.0	-	2.6	-
Craftsmen and kindred workers, n. e. c.	50.9	0.1	-	6.1	11.3	5.9	14.2	-	13.2	0.1
Operatives and kindred workers	1,285.8	3.3	3.8	30.4	810.7	153.7	170.2	3.9	101.7	8.1
Select semiskilled occ. trans., p. u.	272.4	1.2	0.3	14.0	50.1	124.6	64.9	1.1	12.4	3.8
Drivers, bus, truck, tractor	161.6	0.9	0.3	13.7	27.8	69.8	41.1	0.4	4.4	3.2
Delivery, routemen, cab drivers	90.9	0.3	-	0.3	21.6	35.6	23.8	0.7	8.0	0.6
Brakemen and switchmen railroad	9.6	-	-	-	0.3	9.3	-	-	-	-
Power station operators	2.4	-	-	-	0.4	2.0	-	-	-	-
Sailors and deck hands	7.9	-	-	-	-	7.9	-	-	-	-

Table 9 (cont'd)

Occupation	Total	Agri-culture	Mining	Con-struction	Manu-facturing	Trans-portation	Trade	Finance	Ser-vices	Public adminis-tration
Apprentices	16.7	-	-	8.9	5.3	0.3	0.9	-	1.2	0.1
Asbestos - insulation workers	1.3	-	-	0.8	0.4	-	0.1	-	-	-
Semiskilled metal workers	112.0	-	0.1	2.1	106.8	0.6	0.5	-	1.3	0.6
Furnacemen, smelters,pourers	3.4	-	-	-	3.4	-	-	-	-	-
Heaters, metal	0.3	-	-	-	0.3	-	-	-	-	-
Welders and flame cutters	22.2	-	0.1	2.1	17.4	0.6	0.5	-	1.3	0.2
Electroplater helpers	1.7	-	-	-	1.7	-	-	-	-	-
Machine tool opr. mtlwk.Class B	22.5	-	-	-	22.5	-	-	-	-	-
Assemblers, metlwking.Class B	45.1	-	-	-	45.1	-	-	-	-	-
Inspectors, metlwking. Class B	16.8	-	-	-	16.4	-	-	-	-	0.4
Semiskilled occ. textiles - apparel	109.0	-	-	-	109.0	-	-	-	-	-
Knitters, loopers and toppers	3.8	-	-	-	3.8	-	-	-	-	-
Spinners, textile	0.7	-	-	-	0.7	-	-	-	-	-
Weavers, textile	1.7	-	-	-	1.7	-	-	-	-	-
Sewers and stitchers, mfg.	102.8	-	-	-	102.8	-	-	-	-	-
Other operatives and kindred workers	774.4	2.1	3.4	4.6	539.1	28.2	103.8	2.8	86.8	3.6
Attendants, auto service and parking	20.6	-	-	-	0.1	0.2	19.1	-	1.2	-
Blasters and powdermen	0.2	-	0.2	-	-	-	-	-	-	-
Laundry and dry cleaning operatives	44.6	-	-	-	0.4	-	0.1	-	43.9	0.2
Meat cutters except meat packing	32.5	-	-	-	-	0.7	30.7	-	1.1	-
Mine operatives, laborers,n.e.c.	2.7	-	2.7	-	-	-	-	-	-	-
Operatives and kindred workers, n. e. c.	673.8	2.1	0.5	4.6	538.6	27.3	53.9	2.8	40.6	3.4

Table 9 (cont'd)

Occupation	Total	Agriculture	Mining	Construction	Manufacturing	Transportation	Trade	Finance	Services	Public administration
Service workers	941.8	0.8	0.2	3.0	24.8	20.2	215.5	61.9	535.1	80.3
Private household workers	175.7	-	-	-	-	-	-	-	175.7	-
Protective service workers	102.9	0.2	0.1	1.2	8.1	4.5	1.9	6.2	8.9	71.8
Firemen, fire protection	18.2	-	-	-	0.3	0.1	-	-	-	17.8
Guards, watchmen, doorkeepers and bridge tenders	38.0	0.2	0.1	1.1	7.5	3.2	1.5	5.7	8.3	10.4
Policemen, detectives and other law enforcement officials	46.7	-	-	0.1	0.3	1.2	0.4	0.5	0.6	43.6
Waiters, cooks and bartenders	229.0	0.4	-	0.6	2.0	2.8	156.4	1.7	63.8	1.3
Bartenders	29.2	-	-	-	-	-	22.5	-	6.7	-
Cooks, except private household	64.9	0.4	-	0.3	0.7	1.5	35.1	0.5	25.9	0.5
Counter and fountain workers	37.6	-	-	0.2	0.7	0.2	21.8	0.6	13.7	0.4
Waiters and waitresses	97.3	-	-	0.1	0.6	1.1	77.0	0.6	17.5	0.4
Other service workers	434.2	0.2	0.1	1.2	14.7	12.9	57.2	54.0	286.7	7.2
Airline stewards and stewardesses	2.7	-	-	-	-	2.7	-	-	-	-
Attendants, hospital and other inst.	69.8	0.2	-	-	0.1	-	0.1	-	69.1	0.3
Charwomen and cleaners	33.8	-	-	0.2	4.2	1.3	5.1	4.5	17.3	1.2
Janitors and sextons	54.5	-	-	0.5	3.5	1.6	2.5	27.5	17.3	1.6
Practical nurses	19.2	-	-	-	0.1	-	-	-	19.0	0.1
Service workers, n. e. c.	254.2	-	0.1	0.5	6.8	7.3	49.5	22.0	164.0	4.0
Laborers, except farm	368.7	75.6	-	67.6	60.6	60.6	52.5	8.7	31.2	11.9

1. The BLS industry-occupation matrix contains 4 technical occupations whereas this table shows 18 technical occupations based on a study of technical manpower in New York State. Technical occupations will be projected independently of the national-matrix based on the methodology described in New York State Department of Labor, Division of Research and Statistics, Technical Manpower in New York State, Volume I, Supplement B.